Contribution to Palæontology from the Museum of the Second Geological Survey of Pennsylvania.

By Charles E. Hall.

(*Read before the American Philosophical Society April* 6, 1877.)

Genus Eurypterus.

Eurypterus; Dekay, Annals of the Lyceum of Natural History of New York, 1825, Vol. I, p. 375.

The geological horizon of Eurypterus has heretofore been confined to the Water-lime group, in the United States, although the genus has been recently discovered in the English coal measures.

The position of the Water-lime group is between the Onondaga salt group and the Lower Helderberg group, therefore Upper Silurian.

The Water-lime group in Pennsylvania is lithologically well defined, but has not yet, to my knowledge, furnished a single specimen of crustacea. In New York the group is characterized by the crustaceans Eurypterus, Pterigotus and Ceratiocaris.*

Bernician.

Eurypterus Pennsylvanicus (provisional. n. sp.)

In the collection of 1874, made under the direction of Mr. J. F. Carll, in Venango County, Pa., a perfect but indistinct carapace of an Eurypterus was found by his assistant Mr. Hatch.

The specimen agrees in general with Eurypterus remipes of the Water-lime.

Position and locality, in sandy shale overlying a sandstone, which is equivalent to the Garland Conglomerate, at Rooker Farm, Venango Co. Pa.

The horizon is in the transition series between the base of the *Carboniferous* and the top of the *Devonian*.

Carboniferous.

Genus Eurypterus.

Sub-genus Dolichopterus.

Dolichopterus Mansfieldi. (n. sp.)

Carapace semioral, wider than long, indented line visible along the anterior margin, lateral margins nearly straight for one-fourth the length, then evenly rounded; eyes prominent, kidney-form, situated a little forward of the centre of the carapace and about midway between a medial line and the lateral margins.

Body convex, the middle of the thorax slightly wider than the carapace, length of the joints increasing towards the terminal spine-like prolongation.

* See N. Y. Palæontology, Vol. III.

Entire surface covered by small, triangular, imbricating scales, decreasing in size towards the lateral margins; along the anterior portion of the carapace the scales are not visible. The paletti (one of which is preserved) long and narrow, being nearly twice as long as wide, and has the characteristic serrated margin, which is the principal distinguishing feature in the sub-genus. Length of specimen, without terminal joint, two and three-fourths inches; greatest breadth seven-eighths of an inch.

Position and locality. Found in the shale immediately below the Darlington cannel coal, near Cannelton, Darlington Township, Beaver Co. Pennsylvania. Horizon, Alleghany River Series.

We are indebted to Mr. S. F. Mansfield, of Cannelton, for this beautiful specimen, and after whom we deem it proper to name the species.

On the Relative Ages of the Sun and certain of the Fixed Stars.

By Professor Daniel Kirkwood, of Indiana University.

(*Read before the American Philosophical Society, April* 6, 1877.)

The doctrine that the light and heat of the sun are produced by the chemical combination of its elements was very generally accepted till about the middle of the nineteenth century. It has, however, been completely disproved by the labors of Dr. Mayer and Sir William Thomson. The quantity of heat radiated by the sun in a given unit of time has been determined with approximate accuracy. The amount produced by the combustion of a given quantity of coal is also known. From these data it is easily shown that if the sun were a solid globe of coal, and a sufficient supply of oxygen were furnished to support its combustion, the amount of heat resulting from its consumption would be less than that actually emitted within historic times. "Take (in mass equal to the sun's mass) the most energetic chemicals known to us, and in the proper proportion for giving the greatest amount of heat by actual chemical combination; and, so far as we yet know their properties, we cannot see the means of supplying the sun's present waste for even 5,000 years."* The chemical theory is accordingly given up as wholly untenable.

What then is the source of solar energy? To this interesting question, in the present state of our knowledge, but one reply is possible. The great law of the conservation of force—one of the most important discoveries in the history of physical science—points at once to a cause which is adequate both in mode and measure. Motion may be transformed into heat, and *vice versa*. The heat produced by the fall of a given quantity of matter upon the sun from the outer limits of the solar system would be 7,000 times greater than that resulting from the combustion of its own weight of coal. In the mechanical theory of solar energy, as advocated by Helmholtz and

* Tait's Recent Advances in Physical Science, 2nd Ed. p. 152.